

1. PRODUCT DESCRIPTION

The LRF3000A1 laser ranging module is a new lightweight and compact rangefinder module operating at a wavelength of 905 nm. The product provides a maximum ranging distance of ≥ 3000 m. It adopts a UART-TTL interface and is supplied with dedicated test software, making it convenient for users to carry out further development. It features compact size, light weight, and reliable performance. It can be used in aviation, communications, geology, law enforcement,

outdoor sports, and other applications.

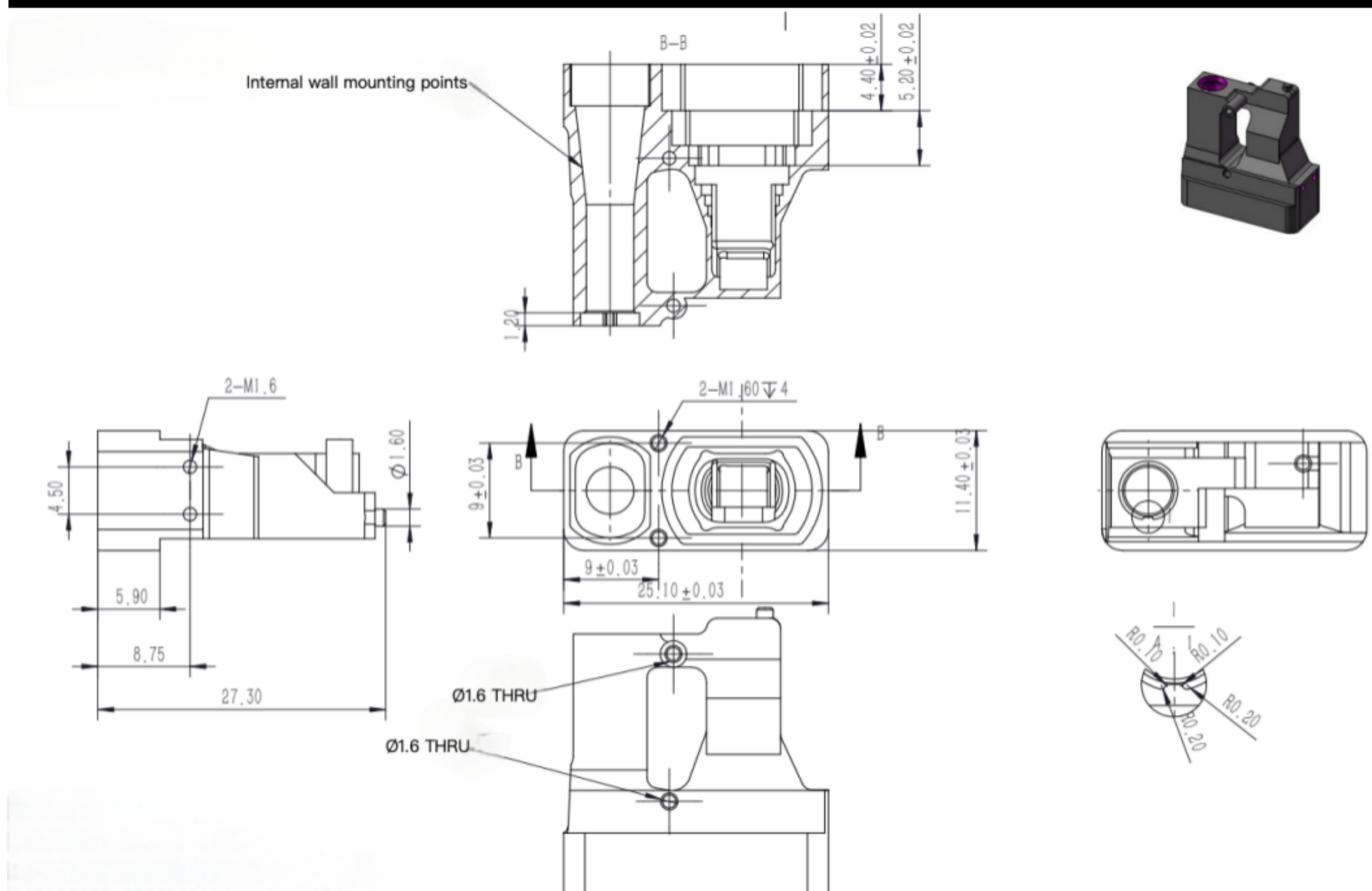


2. TECHNICAL SPECIFICATIONS

Electrical Specifications	Maximum Ranging Distance (clear weather, visibility ≥ 4 km)	≥ 3000 m @ 70% reflectivity, building target
	Minimum Ranging Distance	1 m @ 90% reflectivity, white board
	Ranging Accuracy (building target)	$d \leq 100\text{m}: \pm 0.7\text{m}$ $d > 100\text{m}: \pm (0.7 + 0.003 * d)$ m (d represents distance, in meters)
	Measurement Frequency	Normal Mode: 3–10 Hz, adaptive Long-Range Mode: 1–10 Hz, adaptive
	Valid Measurement Rate	$\geq 98\%$
	False Alarm Rate	$\leq 1\%$
	Baud Rate	115200 bps (factory default) / 9600 bps
	Interface Type	UART(TTL_3.3V)
	Supply Voltage	DC 3.3 V–5 V (ripple < 0.1 V)
	Standby Power Consumption	≤ 350 mW (Power on pulled low)
		≤ 1 mW (Power on pulled high)
	Operating Power Consumption (+3.3 V in)	$\leq 1.8\text{W}@25^{\circ}\text{C}$
		$\leq 2.1\text{W}@70^{\circ}\text{C}$
		$\leq 1.6\text{W}@-20^{\circ}\text{C}$
	Response Time (System Startup + First Ranging)	Minimum: ≤ 160 ms + 100 ms (short range)
		Maximum: ≤ 160 ms + 517 ms (long range)
	Laser Wavelength	905 $\pm$ 10nm

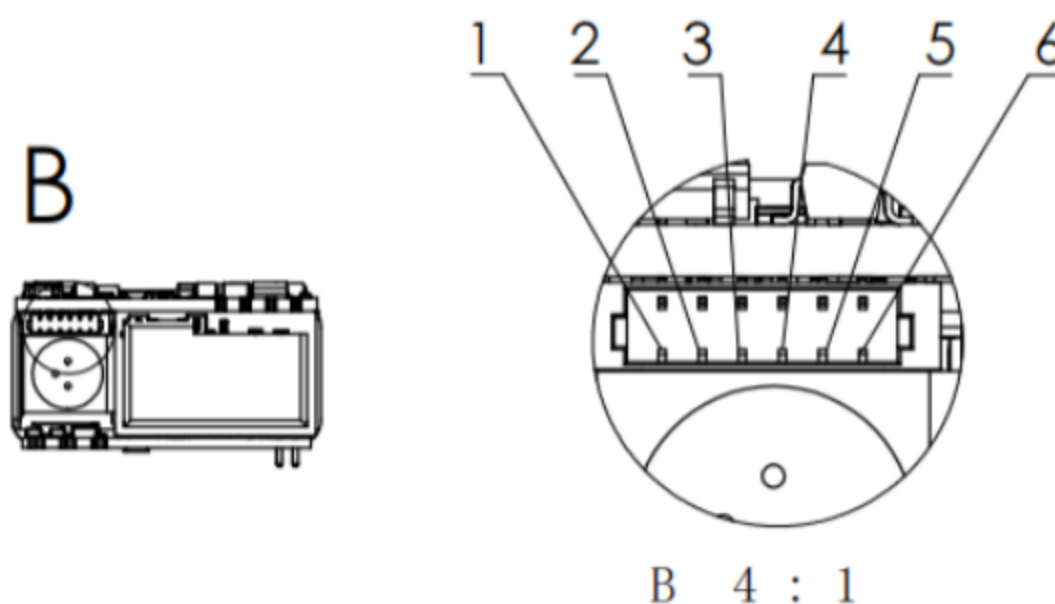
Optical Specifications		Class 1(IEC 60825-1)
	Typical Beam Divergence	≤10mrad
	Average Laser Power	7.63mW
	Receiver Field of View	≈8mrad
Physical Characteristics	Weight	12±0.5g
	Dimensions	13.5mm×25.1mm ×27.8mm
	Shock	1000 g/ms (10 times/s along the optical axis)
	Vibration	5–50–5 Hz, 1 octave/min, 2.5 g
Environmental Adaptability	Operating Temperature	-20 ~ +60℃
	Storage Temperature	-25 ~ +75℃
	Reliability	MTBF≥1500h
	Protection Rating	IP67

3. MECHANICAL DIMENSIONS



4. PIN INTERFACE

Connector Model: A1002WV-S-6P



Pin	Definition	Description
1	GND	Ground
2	Power Supply	3.3 V–5 V DC Power Supply
3	NC	Reserved Pin
4	TTL_TXD	Serial TX, TTL_3.3 V level
5	TTL_RXD	Serial RX, TTL_3.3 V level
6	Enable Pin	Power ON at low level

Low-Power Mode:

In this mode, the device consumes extremely low power. The MCU is turned off and does not respond to any commands.

When measurement is required, pull the Enable pin low to switch the device into normal operating mode. After the measurement is completed, pull the Enable pin high to return the device to low-power mode, where power consumption is less than 1 mW.

5. COMMUNICATION PROTOCOL

Communication mode: using serial communication mode

Baud rate: **115200 (default)**

Data Bits: 8 Bits

Length of a frame: 8 bytes

DATA PROTOCOL									
		Frame header H	Frame header L	Function word	D1	D2	D3	D4	Calibration
	Send	55	AA						SUM(function word +DATA1+...+DATA4)
	Reply	55	AA						SUM(frame header H + frame header L + ...+DATA4)

MEASUREMENT INSTRUCTION									
Single ranging	Send	55	AA	88	FF	FF	FF	FF	SUM[3: 7]
		55 AA 88 FF FF FF FF 84							
	Reply	55	AA	88	STA	FF	DIS_H	DIS_L	SUM[1: 7]
		STA = 0 measurement failure; STA = 1: The measurement was successful DIS_H: high bytes of the measured result; DIS_L: The lower bytes of the measurement result Data returns are returned in hexadecimal, and all data results are output by multiplying the real data by 10							
Continuous ranging	send	55	AA	89	FF	FF	FF	FF	SUM[3: 7]
		55 AA 89 FF FF FF FF 85							
	Reply	55	AA	88	STA	FF	DIS_H	DIS_L	SUM[1: 7]
		STA = 0 measurement failure; STA = 1: The measurement was successful DIS_H: high bytes of the measured result; DIS_L: The lower bytes of the measurement result Data returns are returned in hexadecimal, and all data results are output by multiplying the real data by 10							
Stop ranging	send	55	AA	8E	FF	FF	FF	FF	SUM[3: 7]
		55 AA 8E FF FF FF FF 8A							
	Reply	55	AA	8E	STA	FF	FF	FF	SUM[1: 7]
		STA= 0 closes multiple measurement failures; STA = 1 closes multiple measurements successfully							
Angular measurement	send	55	AA	8A	FF	FF	FF	FF	SUM[3: 7]
		55 AA 8A FF FF FF FF 86							
	Reply	55	AA	8A	STA	FF	ANG_H	ANG_L	SUM[1: 7]
		STA= 0 Measurement failure; STA= 1: Measurement success ANG_H: Measurement result high byte; ANG_L: Measurement result low byte, data return to hexadecimal return, all data results will be the real data multiplied by 10 output, only in the movement with an angle sensor effective							

POWER-ON SELF-TEST									
Self-test information	Reply	55	AA	80	STA	00	00	ErrCode	SUM[1: 7]
		STA= 0 Boot initialization failed, ErrCode is the error code;							
		STA= 1 Boot initialization success. By default, initialization success does not reply to such messages.							

SETTING UP THE SYSTEM									
Baud rate	Send	55	AA	TYPE	FF	FF	FF	FF	SUM[3: 7]
		TYPE = 01 sets the baud rate to 9600 bps TYPE = 02 Set the baud rate to 14400 bps TYPE = 03 Set the baud rate to 19200 bps TYPE = 04 Set the baud rate to 38400bps TYPE = 05 Set the baud rate to 56000 BPS TYPE = 06 Set the baud rate to 57600bps TYPE = 07 Set the baud rate to 115200bps TYPE = 08 Set the baud rate to 128000bps TYPE = 09 Set the baud rate to 230400bps The baud rate does not change immediately after it is set and only takes effect after a restart							
	Reply	55	AA	TYPE	STA	FF	FF	FF	SUM[1: 7]
STA = 0 setting failure; STA = 1 is set successfully									
External circuit enable	Send	55	AA	70	AB	CD	00	00	SUM[3: 7]
		55 AA 70 AB CD 00 00 E8							
	Reply	55	AA	70	STA	00	00	00	SUM[1: 7]
STA = 0, enable failure; STA = 1, enabling success									
		55	AA	71	AB	CD	00	00	SUM[3: 7]
		55 AA 71 AB CD 00 00 E9							
		55	AA	71	STA	00	00	00	SUM[1: 7]
STA = 0, disable failure; If STA = 1, it is disabled successfully									
ErrCode									
Error code	Description								Remarks
0x00	No echo signal was received								
0x16	Out of range: below the minimum range								
0x18	No echo signal was received								
0x00~0x07	Hardware error								

SECONDARY LOW- POWER MODE

1. In this mode, the device's power consumption is reduced, and the MCU is in standby mode, capable of responding to other commands.
2. Send the "External Circuit Disabled" command to switch the device into secondary low-power mode.
3. When a measurement is needed, simply send a "Measurement" related command to automatically switch the device into normal working mode for measurement.
4. Alternatively, send the "External Circuit Enabled" command to switch the device into normal working mode independently.

NOTES

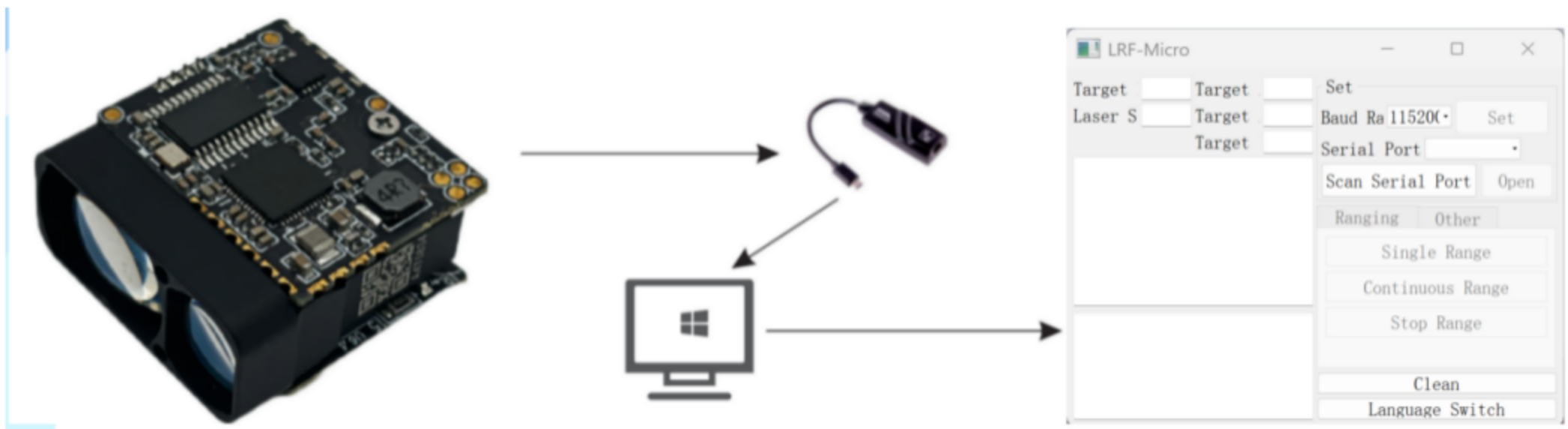
1. The verification content for sending and receiving may differ, so please pay attention to discrimination.
2. The checksum is the lower eight bits of the sum of the bytes requiring verification.
3. All data is transmitted and received in hexadecimal.

6. OPERATION STEPS

Step 1: Insert the data cable into the ranging module, which can supply power to the module and output the measurement data at the same time. (Note: Do not insert the plug in the wrong direction, and strictly control the power supply voltage range between 3.3V and 5V.)

Step 2: Install the Serial Port Genius software and connect to a computer or other control devices through an adapter interface.

Step 3: After the software is installed, open the display interface.



7. OPERATION STEPS

1. When using this module, do not look directly into the laser beam.
2. Do not use a lens barrel or other additional optical devices to operate this module to avoid increasing the risk of eye damage.
3. Do not disassemble the module. Disassembling the product will result in the loss of the right to repair.
4. When transporting, please add sufficient cushioning materials to the packaging box to avoid damage to the module.
5. Do not place the module on an unstable high place to prevent it from falling and being damaged.
6. Do not place the module in a harsh environment or near a heat source to prevent uncontrollable impacts on the module.
7. When there is a sharp change in temperature, there will be condensation fog on the surface of the main lens of the module. Do not use the module at this time.
8. If the exposed lens is dirty, gently wipe it clean with a lens cleaning cloth. Do not use other items to wipe it to avoid damaging the coating layer on the surface of the lens.
9. This module comes with a one-year quality guarantee and lifetime maintenance. In case of quality problems of its own, it can be replaced free of charge. For problems caused by human factors, repair and replacement of parts will be charged according to the actual situation of the product.

The factors that affect the ranging ability, ranging response speed, and speed measurement accuracy include:

Target reflectivity: Target reflectivity: Generally, the higher the target reflectivity, the better the ranging ability and the faster the ranging response speed. For example, for a target with medium reflectivity, a distance of 3000m can be measured, for a target with high reflectivity, a distance of not less than 3500m can be measured, and for a target with low reflectivity, it may only be possible to measure a distance of 2000m. (Targets that are difficult to form diffuse reflection, such as the water surface, may not be measurable.)

Target shape: When the area of the reflective surface of the measured target is too small or uneven, the ranging ability and ranging response speed will be correspondingly reduced.

- **Measurement angle:** When the laser angle is vertically incident on the reflective surface of the measured target, the ranging ability is better and the ranging response speed is faster. Conversely, the ranging ability and ranging response speed will decrease. Using it at extreme measurement angles cannot ensure that the ranging ability and ranging response speed specified in this manual can be achieved.

Measurement environment: The factors affecting the ranging ability and ranging response speed also include the intensity of sunlight, the concentration of water vapor and suspended particulate matter in the air, the angle of deviation from the sunlight irradiation, etc. (For example, in rainy, foggy, snowy, or hazy weather conditions, the measuring range will be reduced.)

The measuring range of this series of ranging telescopes is defined under the following conditions:

- 1) The measured target has a medium reflectivity, such as the wall surface of a building.
- 2) The reflective surface of the measured target is perpendicular to the direction of laser emission.
- 3) The measuring weather is sunny but not under direct sunlight.

Suggestion: When measuring distant targets, please fix this module with a tripod to reduce the shaking of the module during the measurement process, so as to obtain better measurement results.

I . The factors that affect the ranging ability and ranging response speed include:

Target reflectivity: Generally, the higher the target reflectivity, the better the ranging ability and the faster the ranging response speed. For example, for a target with medium reflectivity, a distance of 600 meters can be measured; for a target with high reflectivity, a distance of not less than 800 meters can be measured; and for a target with low reflectivity, it may only be possible to measure a distance of 300 meters. (For targets that are difficult to form diffuse reflection, such as the water surface, it may not be possible to measure the distance.)

Target shape: When the reflective surface of the measured target is too small or uneven, the ranging ability and ranging response speed will be correspondingly reduced.

Measurement angle: When the laser angle is vertically incident on the reflective surface of the measured target, the ranging ability is better and the ranging response speed is faster. Conversely, the ranging ability and ranging response speed will decrease. Using it at extreme measurement angles cannot ensure that the ranging ability and ranging response speed specified in this manual can be achieved.

Measurement environment: The factors affecting the ranging ability and ranging response speed also include the intensity of sunlight, the concentration of water vapor and suspended particulate matter in the air, the angle of deviation from the sunlight irradiation, etc. (For example, in rainy, foggy, snowy, or hazy weather conditions, the measuring range will be reduced.)

II . Suitable Targets for Measurement This product can measure targets with high reflectivity (such as highway road signs), targets with medium reflectivity (such as the walls of buildings), and targets with low reflectivity (such as trees, golf flagsticks, animals, etc.). When the reflectivity drops to a certain level, the measuring range will be correspondingly reduced.



Highway road sign



The wall surface of a building



Trees



Animal

The measuring range of this module is defined under the following conditions:

- 1) The measured target has a medium reflectivity, such as the wall surface of a building.
- 2) The reflective surface of the measured target is perpendicular to the direction of laser emission.
- 3) The measuring weather is sunny but not under direct sunlight.

Remarks:

It is recommended that when you measure distant targets, you fix this module with a tripod to reduce the shaking of the module during the measurement process, so as to obtain better measurement results.

8. SAFETY PRECAUTIONS

8.1 Measured distance result does not match the actual distance

- If tests are carried out in conditions such as heavy smog or water-mist weather with high humidity, it is easy to measure back water droplets or particles in the air. It is recommended to choose a good test environment.
- Under extreme low-temperature conditions, within 20 m there is a risk that the ranging accuracy exceeds the tolerance.

8.2 Ranging performance is reduced, target at theoretical range cannot be measured

- Very low target reflectivity will affect the returned laser energy and thus affect the ranging performance. When the ranging target is a low-reflectivity object such as a lake surface, wet road surface in rainy weather, or glass, the actual performance of the product cannot reach the theoretical range.

- The ranging module does not irradiate the target point vertically but forms a certain angle. In an oblique-measurement state, the returned laser energy will attenuate, resulting in reduced ranging performance.
- Under extreme low-temperature conditions, the ranging performance may decrease slightly.

8.3 Using our complete communication cable to communicate with the PC, no command response

Check whether the communication cable is broken (the 6-pin communication cable is thin and easy to break).

8.4 Using self-prepared cable for communication, no command response

Check whether the external wiring sequence of the module is correct, whether the communication cable is short-circuited, open-circuited or has poor contact, and check whether the serial-port TX and RX wire order is reversed.

